Puritan and Northeastern Beach Tiger Beetles: Threatened Species in Calvert County

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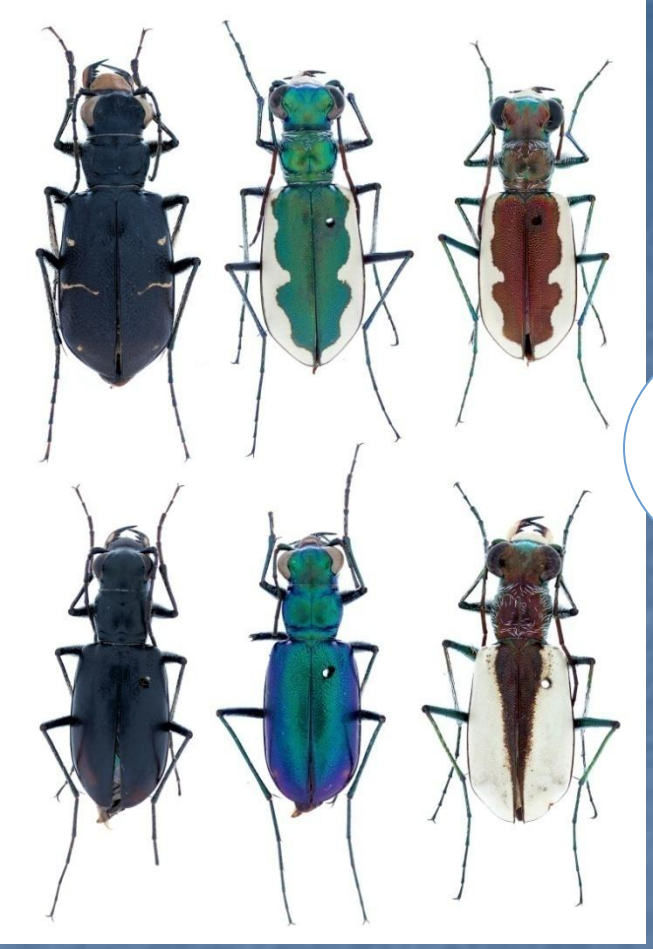
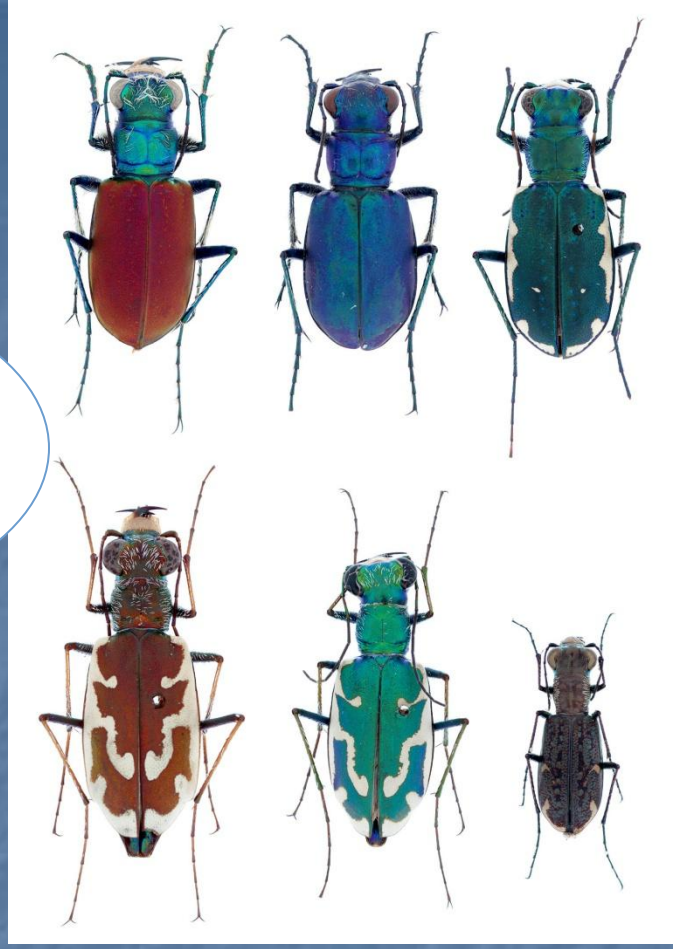
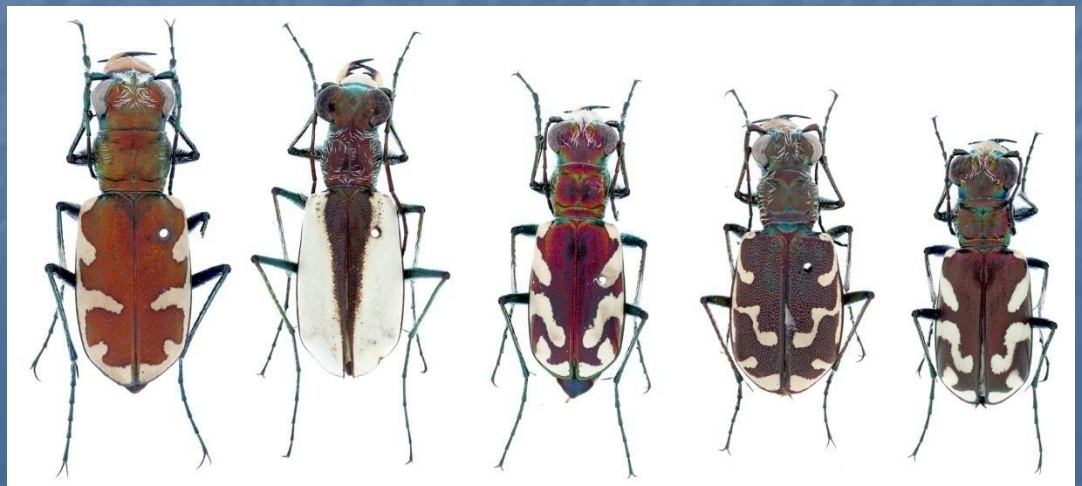
TIGER BEETLES: U. S. DIVERSITY

- 107 SPECIES IN 4 GENERA
- 211 SUBSPECIES
- 20-25 SPECIES IN MOST STATES
- 45 SPECIES, 65 SUBSP. IN NEW MEXICO

COLOR AND MARKING VARIATION







HABITATS

ADULT BEHAVIOR (*Cicindela*)

- Voracious predators on small arthropods, may also scavenge on dead animals
- Visual hunters, dart quickly after prey
- Use mandibles to grab and macerate prey

BEHAVIORAL THERMOREGULATORS

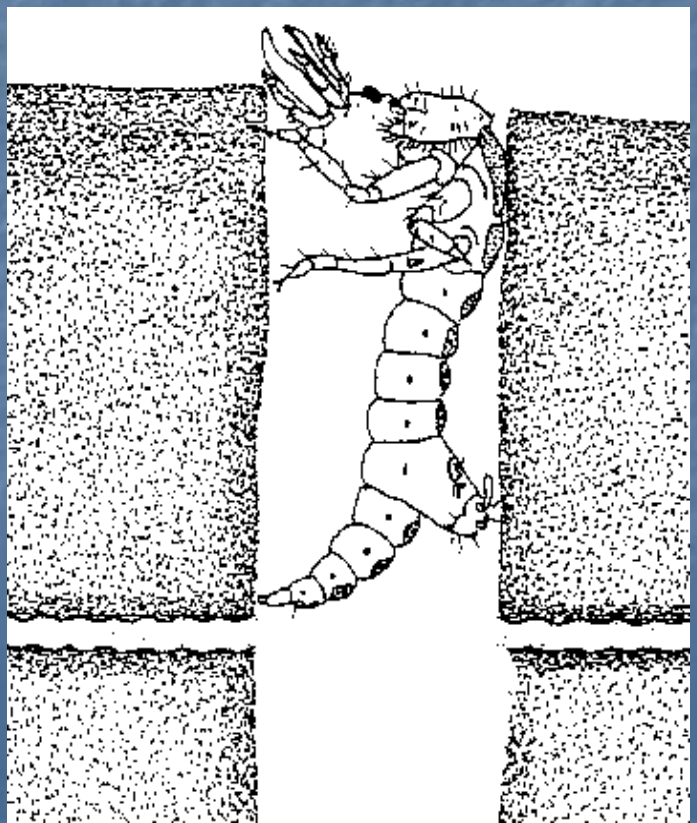
- Maintain high body temperatures by behavioral thermoregulation
- Stilting, sun-facing, shuttling, burrowing

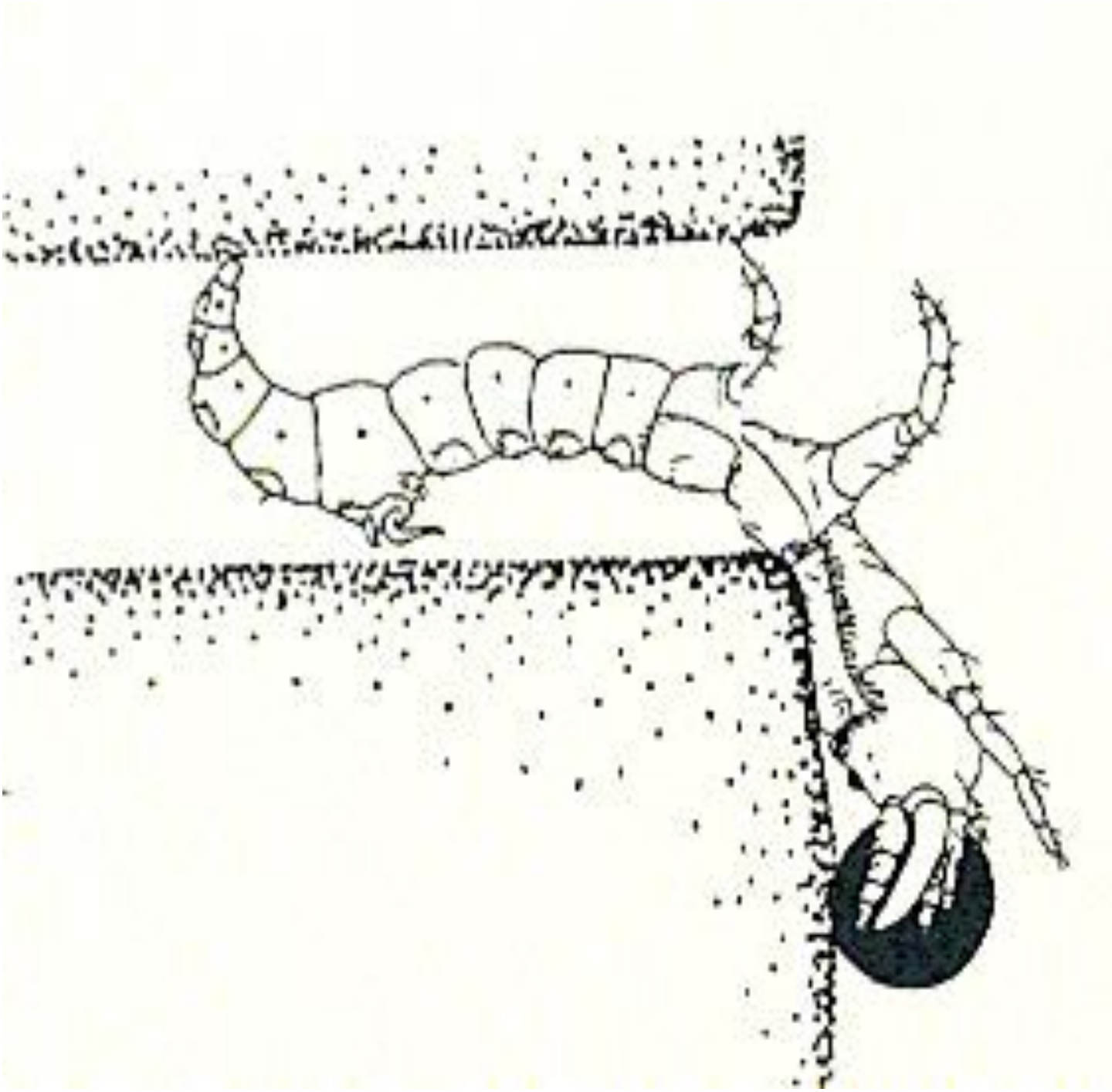
ADULT ENEMIES

ROBBER FLY WITH PTB

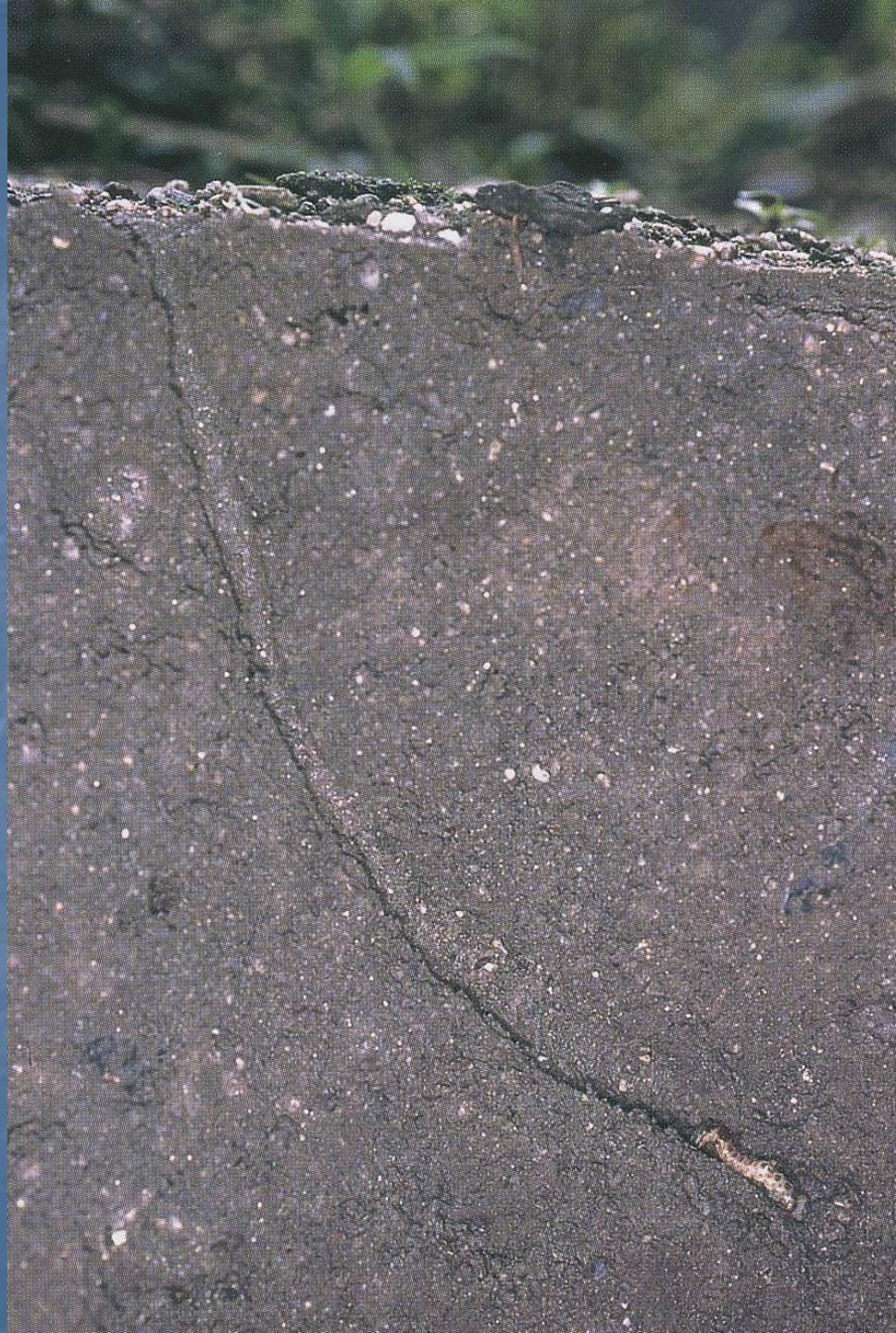
LARVAE

- Sit-and-wait, burrow-dwelling predators
- Attack small arthropods approaching burrow mouth





BURROW DEPTHS, 6” TO SEVERAL FEET



Parasitic wasps kill larvae

THEIR VALUE IN CONSERVATION STUDIES

- Easily seen and identified in the field due to color and marking patterns; charismatic invertebrates
- Easy to estimate population size and study ecology and behavior
- Indicators of habitat type
- Indicators of tropical biodiversity
- Indicators of habitat disturbances

THREATENED AND ENDANGERED INSECTS

- 17 beetles- including **4 tiger beetles (+ 2 candidates**
- 24 butterflies, moths, skippers
- 1 grasshopper
- 1 aquatic bug
- 1 fly
- 1 dragonfly

CRITERIA FOR LISTING

- Rarity: Numbers of populations, individuals and sites
- Distribution
- Evidence of decline (historic)
- Current threats, impacts


CALVERT
SHORELINE
TIGER BEETLES

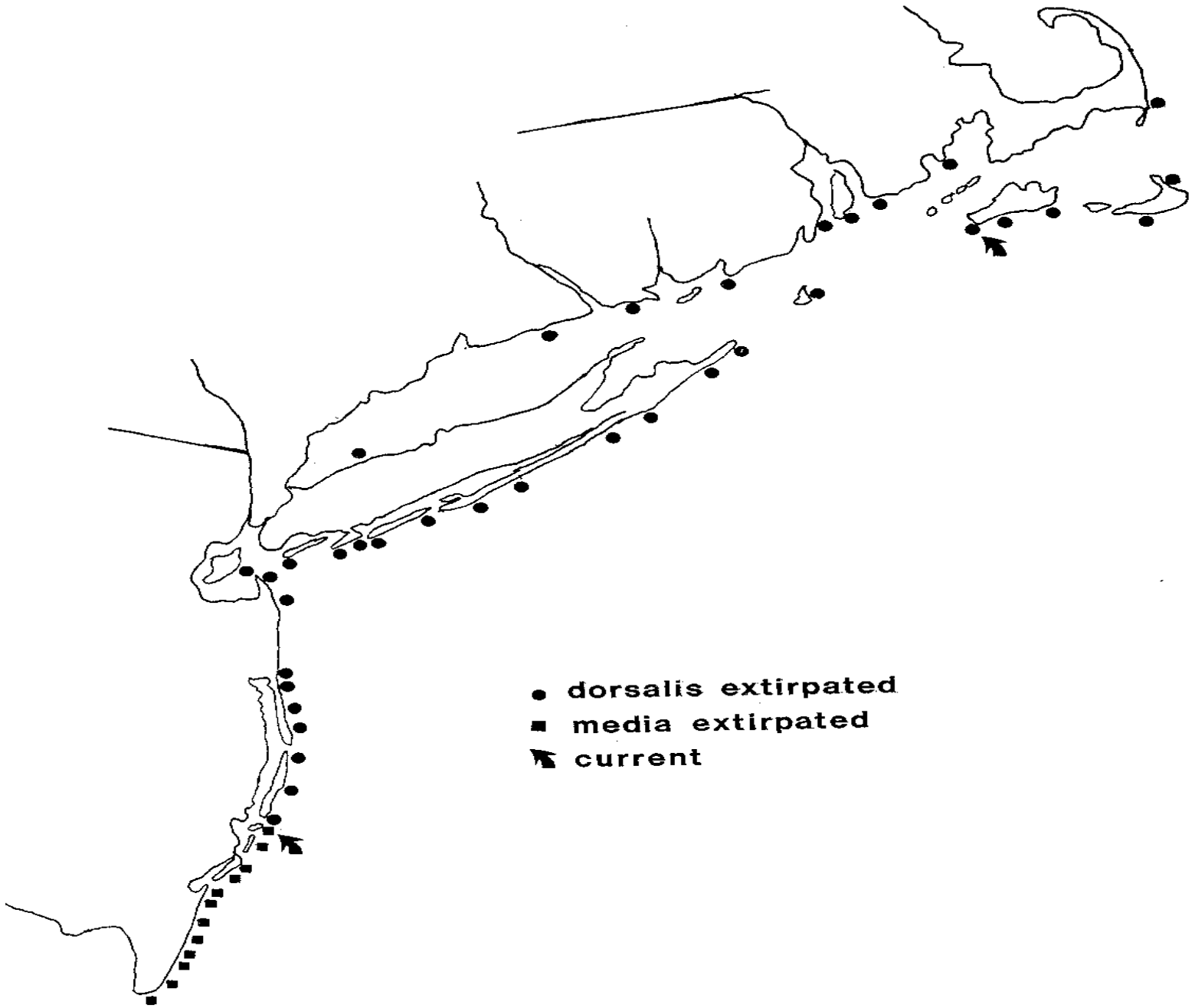
NORTHEASTERN BEACH TIGER BEETLE

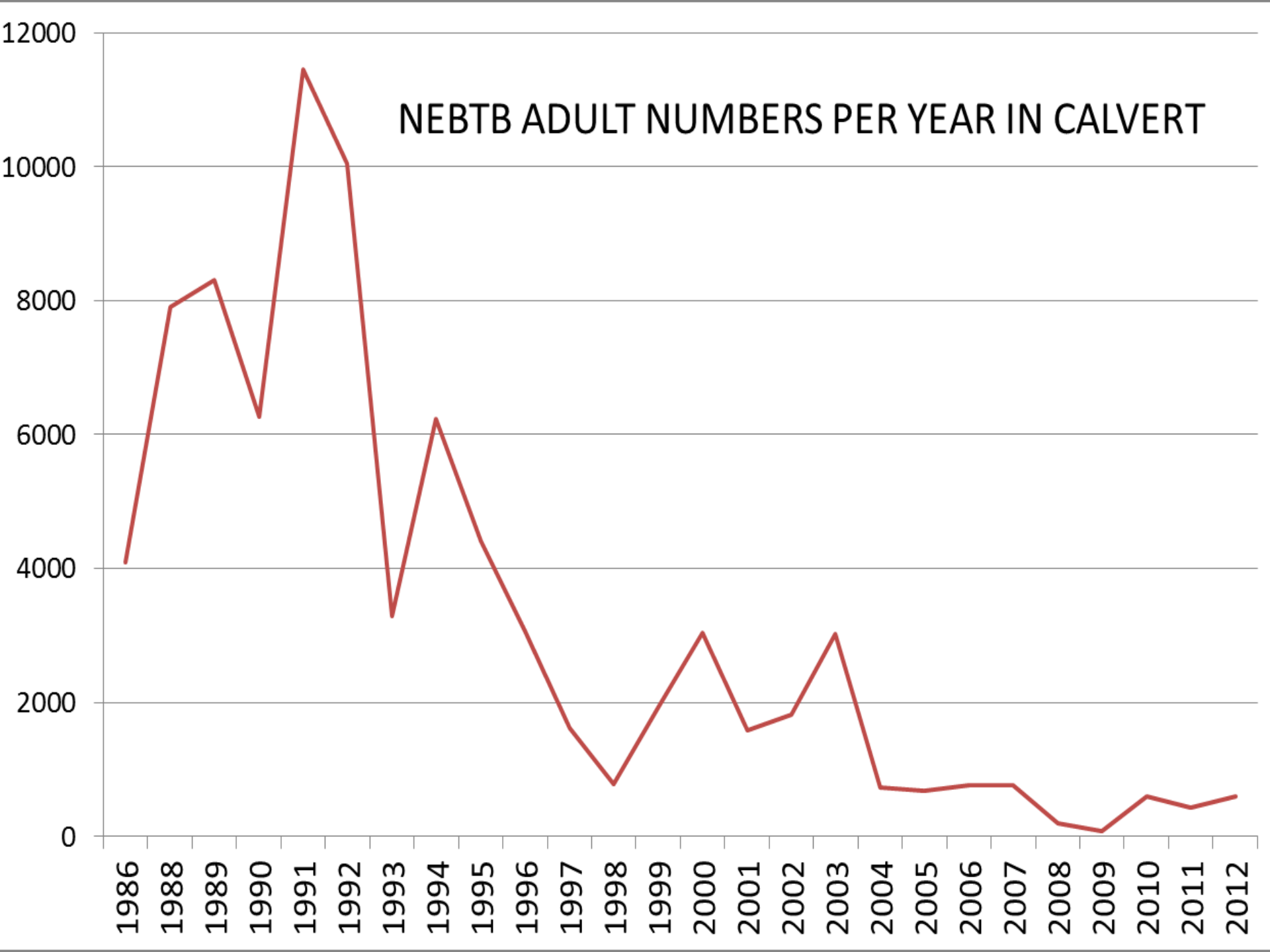
Cicindela dorsalis dorsalis

Threatened, Extirpated from most of its range (NJ to MA)

Main concentration on Ches. Bay beaches

Impacted by shoreline stabilization, lack of protected sites


dorsalis extirpated
media extirpated
current

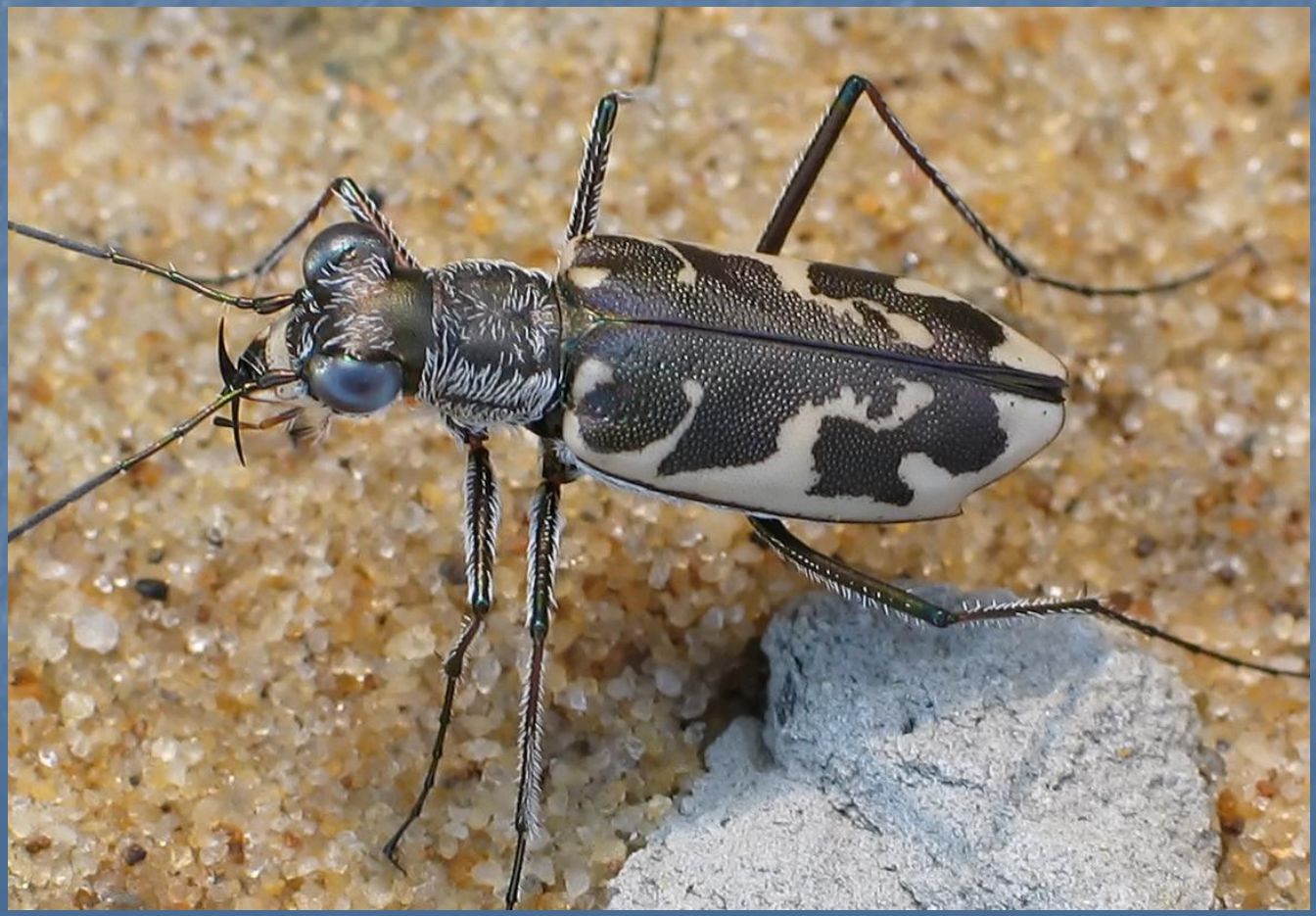

NEBTB ADULT NUMBERS PER YEAR IN CALVERT
12000
10000
8000
6000
4000
2000
0
1986
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

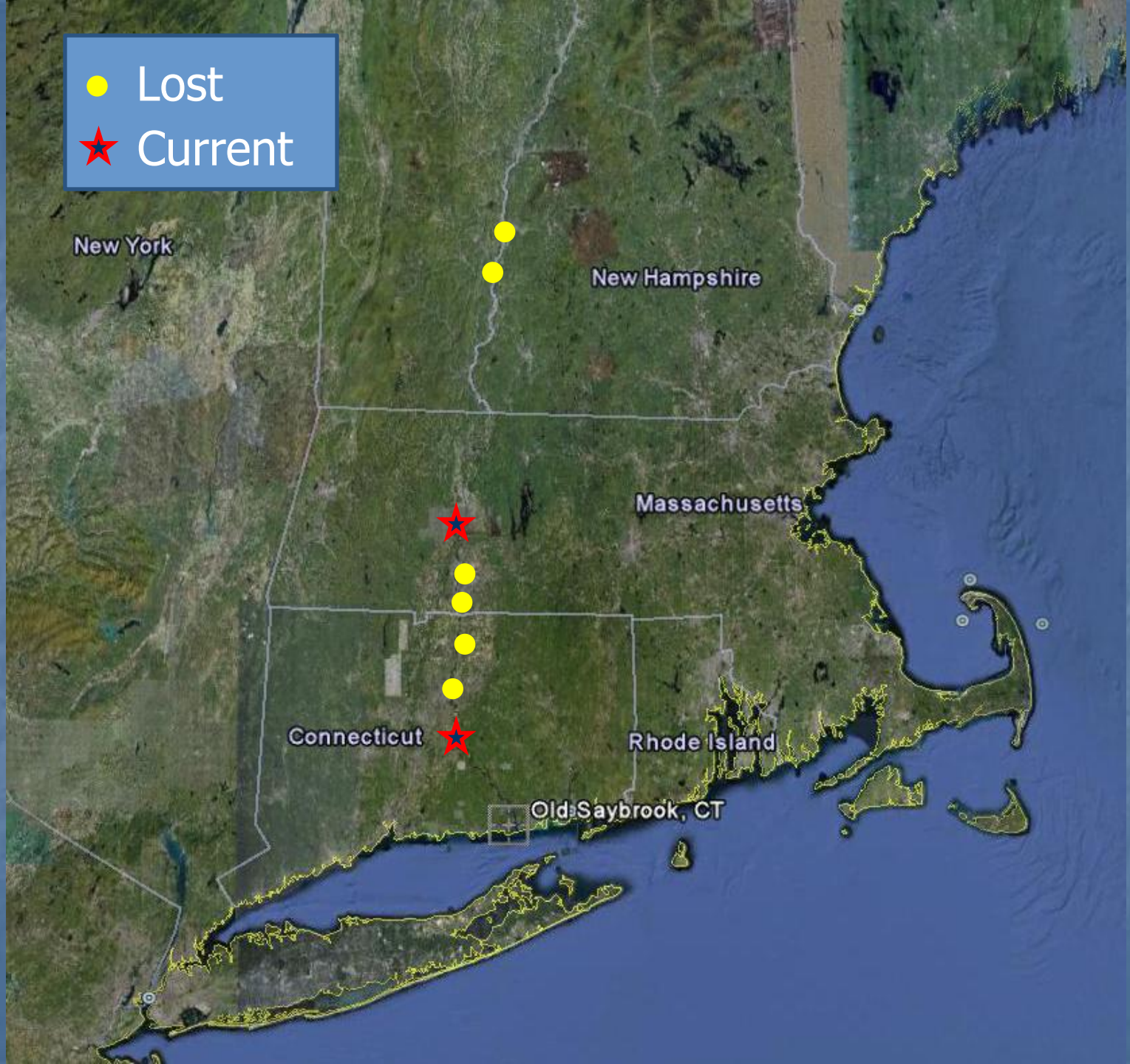
DECLINE IN CALVERT

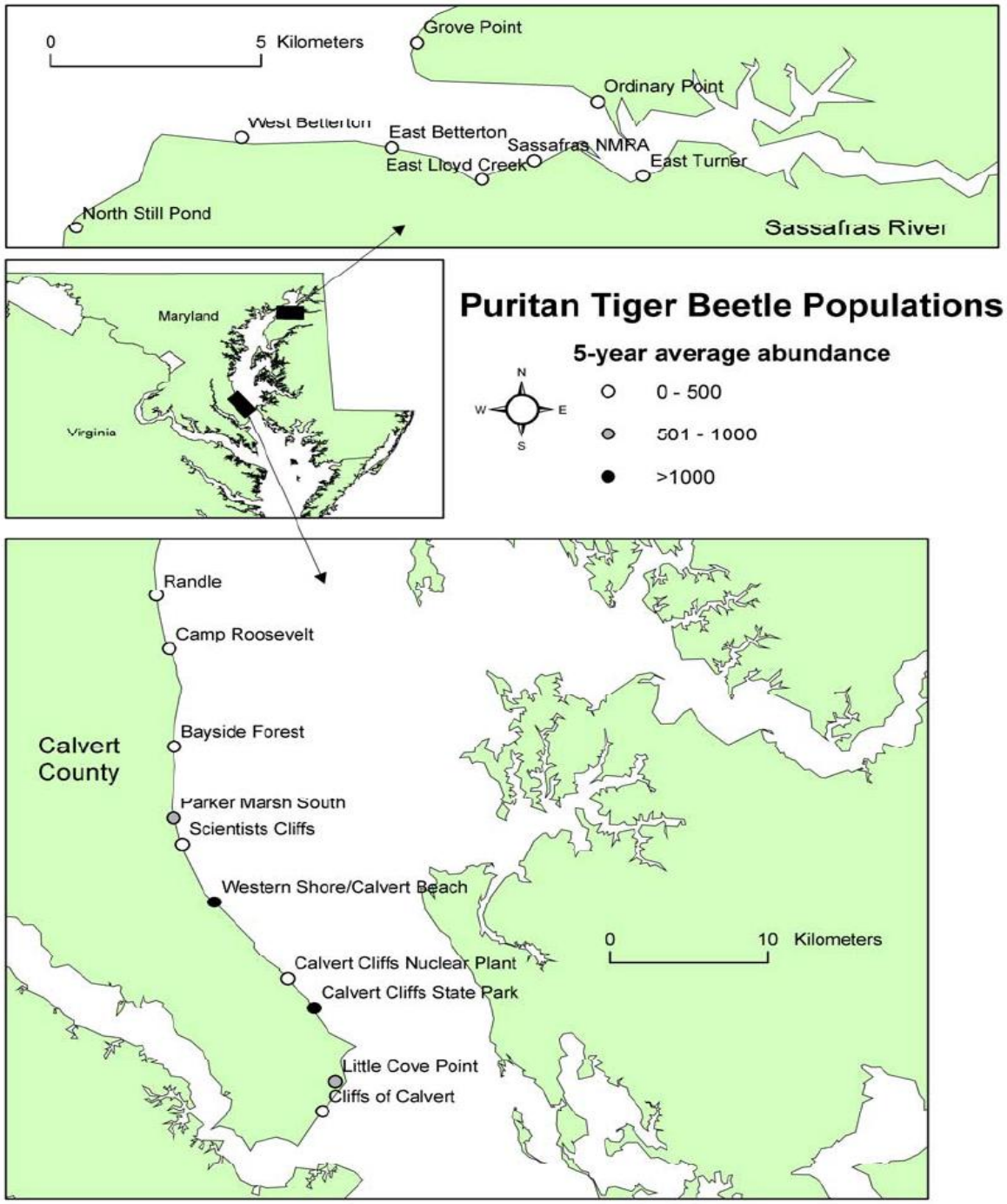
- Flag Ponds: Over 3000 to 0 in 2010. Shoreline change and disturbance
- Scientists Cliffs: Over 2000 to 0 in 2004.
- Small area of habitat, increase in human activity
- Cove Point: 700 in 1990, 0 in 2005. Shoreline erosion, limited suitable shoreline
- North of Calvert Beach: Over 3000 in early 1990s to <700 after 2007. Unknown cause

PURITAN TIGER BEETLE (*CICINDELA PURITANA*)

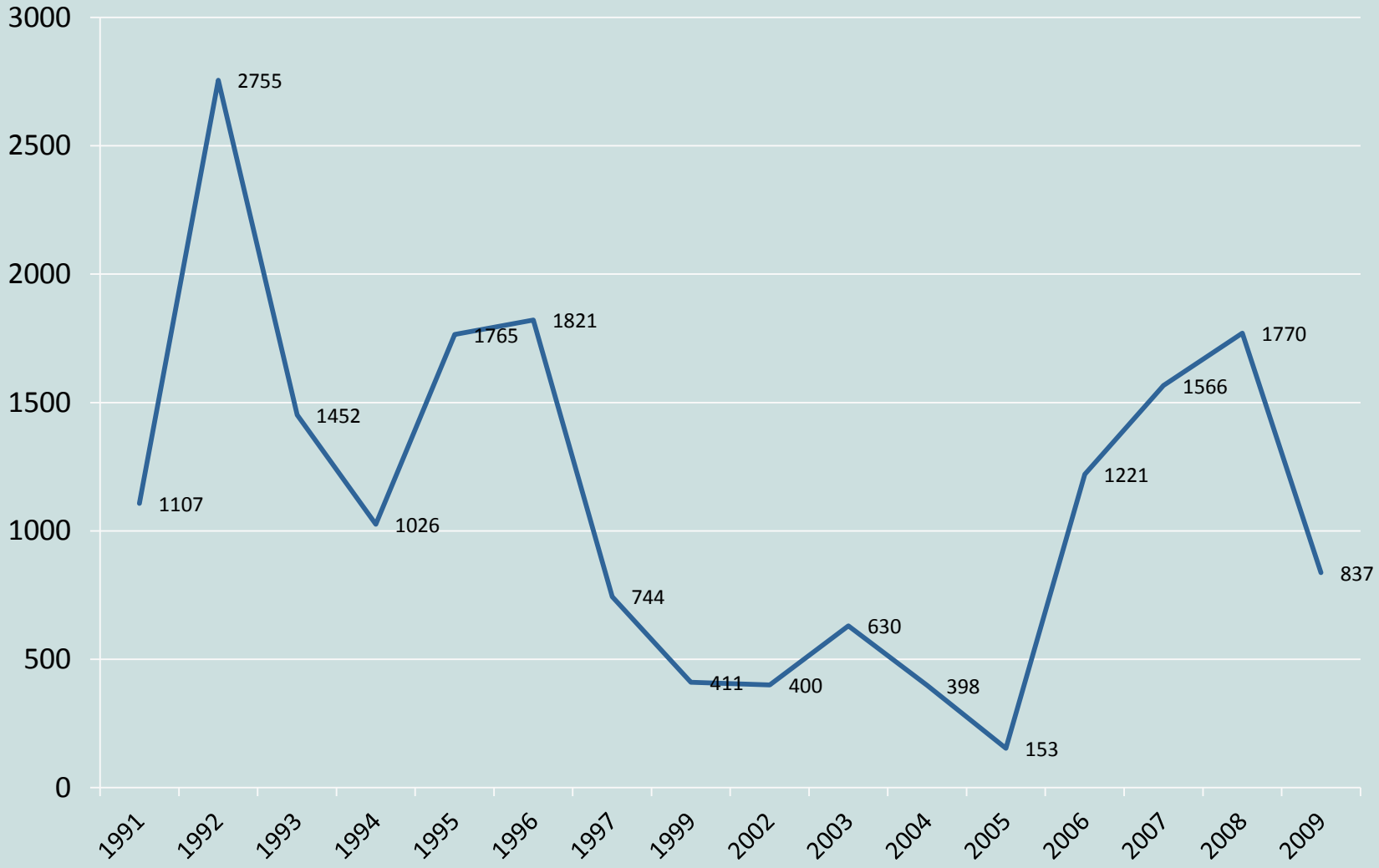
FEDERALLY THREATENED SPECIES,
3 metapopulations survive: 2 in MD, 1 in CT

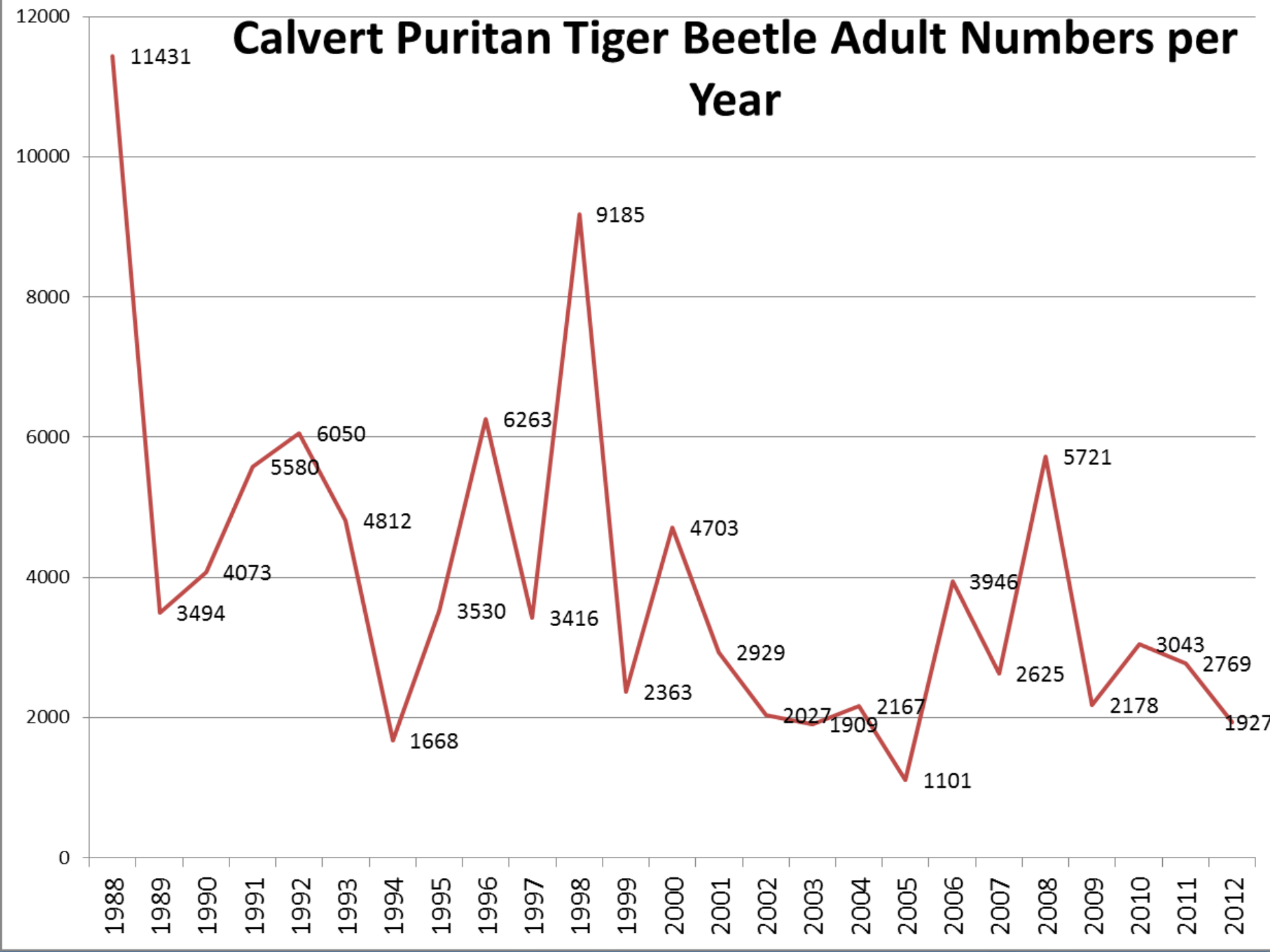



Lost
Current
New York
New Hampshire
Massachusetts
Connecticut
Rhode Island
Old Saybrook, CT


0
5 Kilometers
Grove Point
Ordinary Point
West Betterton
East Betterton
Sassafras NMRA
East Lloyd Creek
East Turner
North Still Pond
Sassafras River
Maryland
Virginia
Puritan Tiger Beetle Populations
5-year average abundance
N
W
E
S
0 - 500
501 - 1000
>1000
Randle
Camp Roosevelt
Calvert County
Bayside Forest
Parker Marsh South
Scientists Cliffs
Western Shore/Calvert Beach
0
10 Kilometers
Calvert Cliffs Nuclear Plant
Calvert Cliffs State Park
Little Cove Point
Cliffs of Calvert

SASSAFRAS


3000
2500
2000
1500
1000
500
0
2755
1107
1452
1026
1765
1821
744
411
400
630
398
153
1221
1566
1770
837
1991
1992
1993
1994
1995
1996
1997
1999
2002
2003
2004
2005
2006
2007
2008
2009


Calvert Puritan Tiger Beetle Adult Numbers per Year
12000
10000
8000
6000
4000
2000
0
11431
3494
4073
5580
6050
4812
1668
3530
6263
3416
9185
2363
4703
2929
2027
1909
2167
1101
3946
2625
5721
2178
3043
2769
1927
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

KEY CALVERT POPULATIONS

- Warrior Rest (N of Scientists Cliffs)
- Calvert Cliffs State Park
- Chesapeake Ranch to Little Cove Pt.

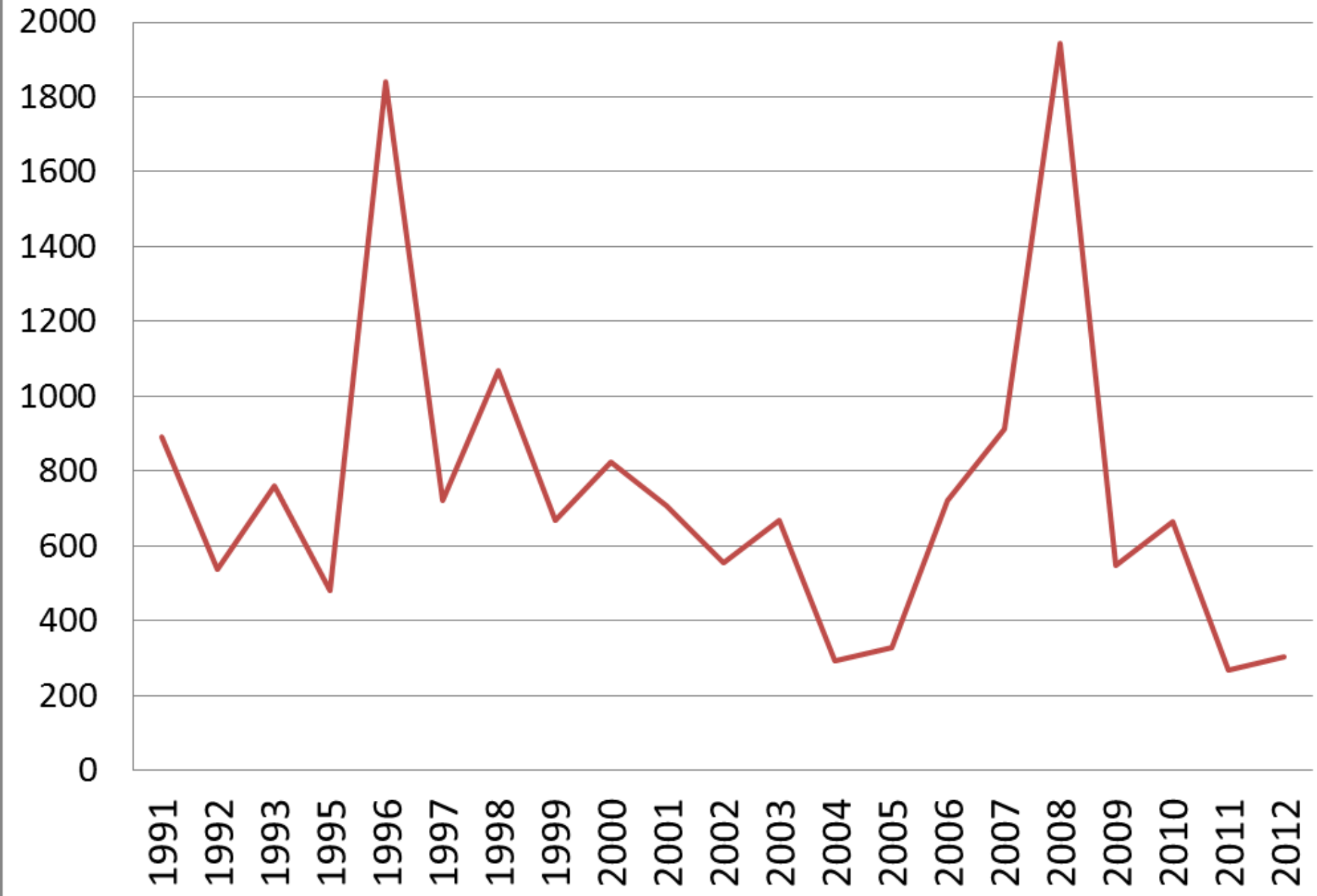
- North Calvert Beach
- CC Nuclear Power Plant

CALVERT METAPOPULATION
(CURRENT//PEAK NUMBERS)

- RANDLE CLIFF 29//234
- CAMP ROOSEVELT 0//73
- BAYSIDE FOREST 53//149
-
- WARRIOR REST 883//1366
- SCIENTISTS CLIFFS 105//600
- CALVERT BCH NORTH 120//4891

CC NUCLEAR PLANT	177//616
CC STATE PARK	199//1609

Ches. Ranch and Little Cove Adult PTB



ADULT BEHAVIOR and LIFE CYCLE

LARVAL HABITAT: KEY TO POPULATION GROWTH AND SURVIVAL

- Adult female determines next generation by selection of egg laying site
- Lab and field studies indicate only fine-medium, moderately compacted soil is preferred
- Suitable soil is nearly always at top of bluffs; females move from beach to top
- Eggs laid and larvae become new adults in two years

NATURAL MORTALITY FACTORS

NATURAL ENEMIES: ADULT PREDATORS is INSIGNIFICANT

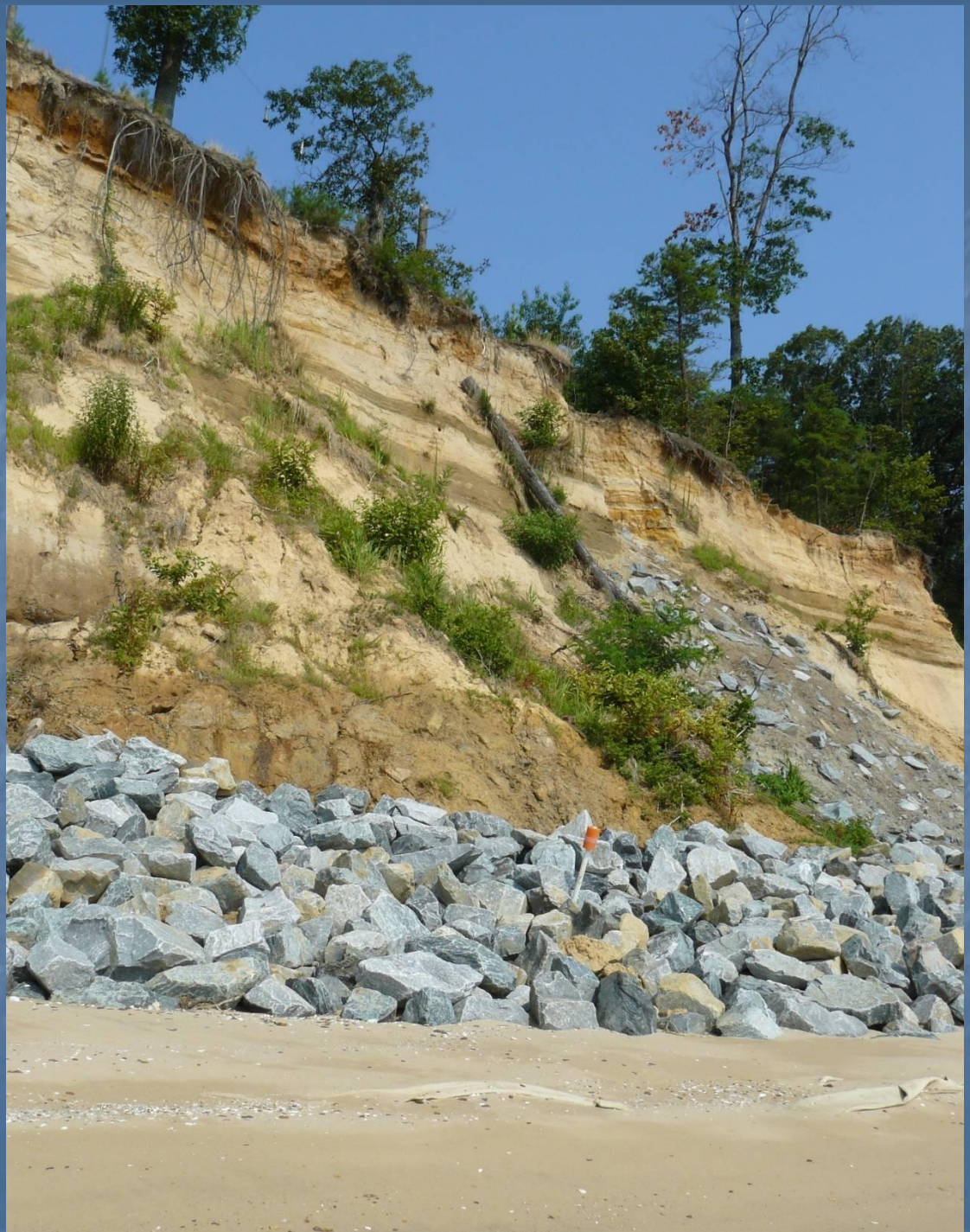
LARVAL PARASITES VERY IMPORTANT

LARVAL FOOD COMPETITION AND PREDATION ON ADULTS BY *C. REPANDA*

HIGH DENSITY REPANDA LARVAL PATCHES ON LOW BLUFFS

STORMS/EROSION/BLUFF BREAKDOWN

SHORELINE STRUCTURES = VEGETATION GROWTH ON BLUFFS



REVETMENTS = LOSS OF SUITABLE BEACH FOR ADULTS

SOLUTIONS FOR PTB SURVIVAL AND RECOVERY

- ARE THERE NEW SITES OR RESTORABLE SITES? NO NEW SITES; VEGETATION CONTROL TRIAL IN PROGRESS AT STATE OWNED SITE IN EASTERN SHORE
- LAB REARING ? YES
- TRANSLOCATION TO NEW SITES? COULD BE DONE BUT NO SITES AVAILABLE

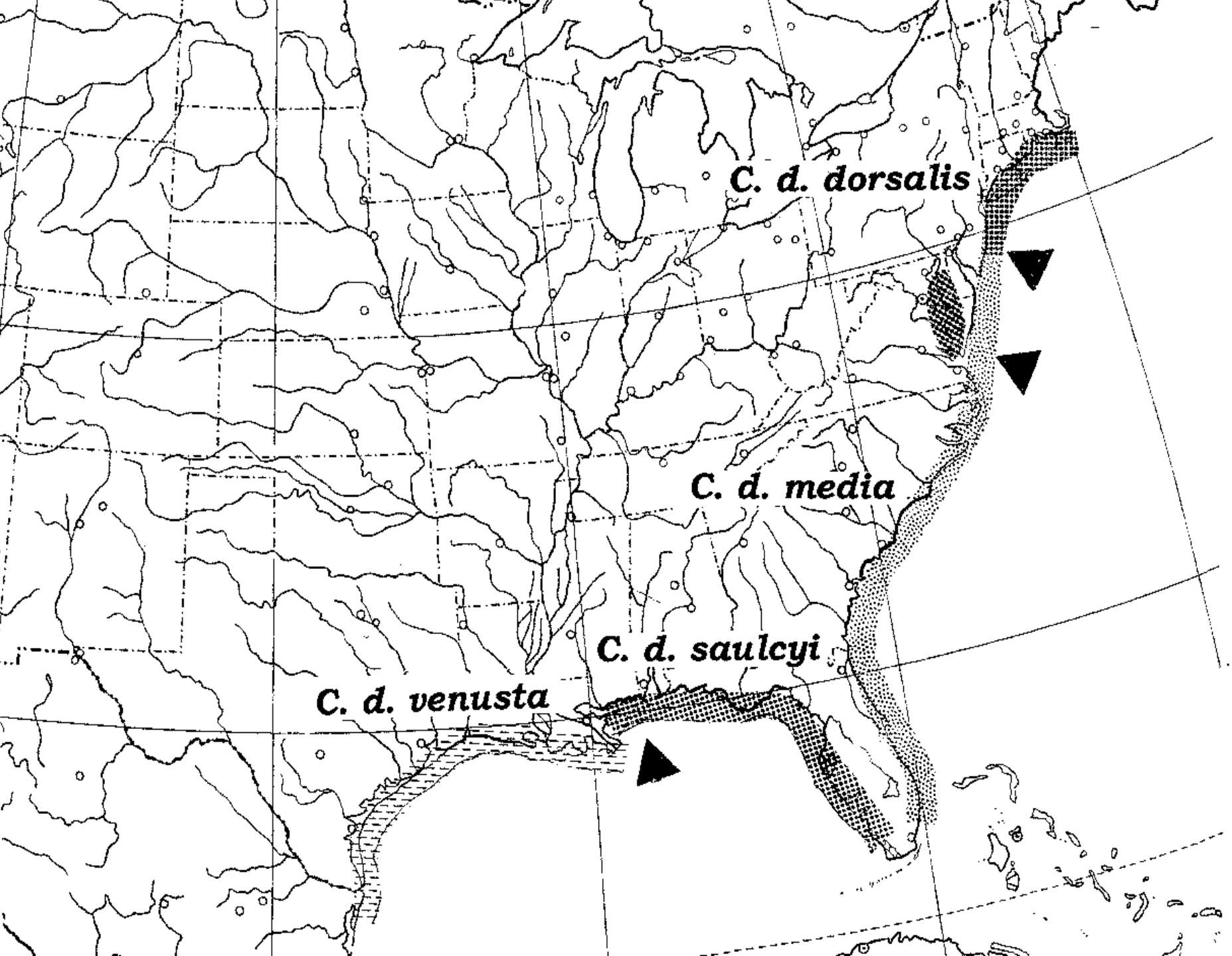
WILL ANY SHORELINE STABILIZATION REDUCE EROSION AND RETAIN HABITAT ? UNLIKELY

CAN ANY HABITAT/SITES BE SACRIFICED? UNDER STUDY USING PVA

Figure 10. Cliffs of Calvert

Numbered points indicate GPS waypoints associated with beetle counts in Table 1.

Sites	1989	1991	1992	1993	1994	1995	1996	1997	1999	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Grove Point		1000+	1667	750	567	920	1230	452	150	78	195	254	90(156	273	843	986	347	1322	750
Ordinary Point	650	12	215	88	110	208	78	45	120	0	9	40	28	30	53	100	41	24	75
North Stillpond.			217	190	87	133	138	92	44	220	119	42	26	143	66	120	99	54	70
W. Betterton		79	281	234	160	210	131	78	64	69	126	34	52	23	6	92	55	66	112
E. Betterton		0	20	19	40	44	21	28	7	11	16	6	12	6	12	34	15	59	52
East Lloyd		9	205	139	15	94	118	30	16	8	160	11	96(73)	554	368	139	115	559	249
West Turner	150	0	51	12	47	88	80	19	10	12	3	3	18(4)	172	218	296	165	589	203
East Turner	150	7	99	20	0	68	25	0	ns	2	2	8	35	20	0	3	0	32	3
Totals	**950**	**1107+**	**2755**	**1452**	**1026**	**1765**	**1821**	**744**	**411**	**400**	**630**	**398**	**153**	**1221**	**1566**	**1770**	**837**	**2705**	**1514**


C. d. dorsalis
C. d. media
C. d. saulcyi
C. d. venusta